

# A Potential Agroforestry Species *Butea monosperma* (Palash) For Farmers' Prosperity

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## Abstract

*Butea monosperma*, commonly known as Palash or Flame of the Forest, is a multipurpose tree species native to India. It has immense potential for agroforestry due to its drought resistance, nitrogen-fixing capability, and multiple economic uses, including natural dye production, gum extraction, and fodder supply. Palash-based agroforestry systems, such as agri-silviculture, silvo-pastoral systems, and boundary planting, can provide sustainable solutions for enhancing rural livelihoods, improving soil health, and conserving biodiversity. Palash-based agroforestry presents a promising avenue for sustainable agriculture and rural development in India, contributing to economic resilience and environmental sustainability.

## Introduction

Agroforestry systems involve the intentional integration of trees into agricultural landscapes to promote ecological interactions and synergies. This approach can enhance biodiversity, improve soil health, and increase crop yields. By accumulating more carbon in their biomass and often conserving greater biodiversity, agroforestry systems set themselves apart from other types of agriculture (Schroth et al., 2011). Today agroforestry is an important part of the Evergreen Revolution movement in the country. India became the first country in the world to adopt a National Agroforestry Policy in 2014. The policy aims to improve agricultural productivity and environmental sustainability by integrating trees, crops, and livestock into the same plot of land. Over twenty-five years of investments in research have demonstrated the potential of agroforestry in many parts of the country and some practices have been widely adopted. With the interplay of several complex factors, understanding the biophysical issues related to productivity, water resource sharing, soil fertility, and plant interactions in mixed communities is insufficient, mainly because of the observational nature of research. Agroforestry has a role to play in both situations by making land

use more sustainable and by making inhabited reserves ecologically and economically more viable.

Among the various species used in agroforestry systems, *Butea monosperma*, commonly known as the flame of the forest or palash, plays a significant role in agroforestry systems, particularly in enhancing ecological interactions and promoting sustainable agricultural practices. Palash is widely found in the tropical and subtropical regions of India. It is common in states like Jharkhand, Chhattisgarh, Odisha, Madhya Pradesh, Uttar Pradesh, Maharashtra, and parts of West Bengal and Bihar. It thrives in areas with dry and deciduous forest cover. It is well-suited for agroforestry due to its hardy nature and multiple uses. It is highly drought-resistant and can grow in degraded soils. The tree enriches the soil by fixing nitrogen, thereby improving soil fertility and supporting agricultural productivity. Their deep roots prevent soil erosion and improve water retention. Palash provides flowers, leaves, gum, and wood, all of which have economic value. Its flowers are used for natural dyes, its gum for medicinal and industrial purposes, and its wood for fuel and construction. In addition, it also supports the socio-economic well-being of a rural community particularly in the dry regions like Bundelkhand region of Central India. *B. monosperma* plantations either grown naturally or intentionally, provides several advantages in the wastelands as well as in the farmlands which generates additional ecological and socioeconomic benefits.

*Butea monosperma* based agroforestry system has not been systematically studied so far though such plantations can be often seen in the several farmlands. There are only a very few reports on *Butea* + crop combinations. *B. monosperma* plants are mostly preferred as boundary plantations by the farmers at their farmlands. *Butea* plants can be easily grown with annual crops like cereals, pulses, oilseeds, fiber crops and cash crops. This multipurpose tree species can be integrated into agroforestry systems in the following ways:

## Silvo-Pastoral Systems

Palash trees may be planted alongside animal grazing areas in silvo-pastoral systems. The trees provide animals shade and contribute to the health of the land, while the leaves are used as feed. The research indicated that compared to open grazing areas, the soil moisture content beneath *Butea* plantings was substantially greater. Approximately 85% of the total absorption was transferred to the aboveground portions of the plant. The amount of nutrients replenished to the soil by roots was less than the loss of litter in both open grazing land and *butea* plantings. The research found that *Butea* trees may greatly enhance soil fertility by decomposing nutrient-rich litter and turning over their leaves quickly, which raises the understorey's nutritional value (Kumar *et al.*, 2010). Anand *et al.* (2016) reported that *Butea* with natural or perennial grass silvo pastoral system was widely adopted in Sonbhadra districts of Uttar Pradesh.

## Agri-Silviculture Systems:

Palash is grown alongside crops such as millets, pulses, or oilseeds. Trees planted at a spacing of 6m x 6m to ensure adequate sunlight for crops. Pruning during the growing season to minimize shading and enhance growth. The trees improve soil fertility, and their shade-tolerant nature allows for undergrowth of certain crops. The absence of allelopathy effect from the tree species is one of the important criteria for inclusion of the species in agroforestry. In case of Palash -based agroforestry practices, no significant studies have been conducted till date Farmers can harvest flowers, gum, and wood from the trees while cultivating crops beneath them.

- An agroforestry system based on paddy and palash (*Butea monosperma*): In various regions of central India, it has also been reported that the species Palash has been planted on the field's ridge alongside rice crops in order to cultivate Lac, which typically offers an annual return of ₹.800 per tree. Because the rural community in the Bilaspur district of Chhattisgarh state views it as a crucial component of the land use system for fuel wood, lac rearing, traditional leaf plate making, and other economic benefits, one study has systematically assessed the responses of paddy cultivation under a traditionally natural *B. monosperma*-based agroforestry system (Singh *et al.*, 2008).

- *Butea monosperma* (Palash) + wheat-based agroforestry system: According to Prasad *et al.*, (2016), *B. monosperma* has an allelopathic influence on the germination and development of rabi crops such as chickpea (*Cicer arietinum*), mustard (*Brassica nigra* L.), and lentil (*Lens culinaris*). Wheat has a strong inhibitory impact at a low level, making it the ideal crop to intercrop with palash.
- *Flemingia semialata* + palash (*Butea monosperma*) + *Ziziphus* tree: CAFRI implemented a lac-based farming system for *Ziziphus* and Palash trees in the semi-arid Bundelkhand area to increase farmers' livelihood options (Tewari *et al.*, 2013). Similar models are also widely used in Jharkhand's farming community.

## Boundary Planting

Farmers can plant Palash along field boundaries. This practice prevents soil erosion, acts as a windbreak, and provides additional income through the sale of flowers, seeds, and gum. Palash trees can serve as a buffer, reducing the pressure on natural forests for resources like fuelwood and fodder. This system also helps in conserving biodiversity.

**Silvo-Horti systems:** Palash can be integrated into horticultural systems with crops like mango, guava, or tamarind, adding ecological balance and enhancing farm income.

## Economic Benefits of Palash-Based Agroforestry

- *B. monosperma* has significant Economic importance particularly for the rural communities. *B. monosperma* leaves are the source of fairly good and compatible feed enriched with minerals used as fodder. *Butea* leaves have traditionally been used by rural communities to make plates and cups, locally called as 'Dona Pattal' particularly in the Bundelkhand region and provides a means of subsistent remuneration to the villagers. This is a very good alternative to polythene or plastic-based plates or cups as they are healthy and safe and completely biodegradable so avoid any sort of environmental pollution as well.
- Wood has limited use for utilisation as timber. Mainly used as a fuel wood or for local purposes. The wood is burned to make charcoal for gunpowder. From its wood, high-quality charcoal can also be produced.

- The Popularly known 'Butea gum', 'Bengal Kino' obtain from the palash. one tree, around 300 g of gum is typically harvested and sold for a supplementary price of Rs. 400–500 per kg. This offers a source of income generation to the tribal communities in particularly in the states like Madhya Pradesh, Uttar Pradesh, and Chhattisgarh. Palash trees are found naturally and extensively in farmer's fields and degraded areas in the Central Indian state of Bundelkhand. According to research conducted at the National Research Centre for Agroforestry in Jhansi, farmers typically have 10–15 *Butea monosperma* trees per hectare on their fields, which the local tribe (Saharia) uses to gather gum-butea, or kamarkas. Incisions made on the stem's bark and tree development parameters have a significant impact on gum yield. A tribal household makes, on average, 677 rupees every season. The number of man-days worked, the number of trees approached, the total quantity of gum gathered, and the overall revenue all show significant connections.
- Fibers from the inner bark of the stem and root are used for paper making, caulking the seams of boats, and manufacturing cordage. Traditionally, it is popular as 'Bakambra' in Uttar Pradesh and 'Chhoel' in Bihar (Orwa *et al.*, 2009). These fibers have negligible economic value, but since they are durable and water-resistant, the tribal people use them extensively to make sails and boats. Studies have also identified It has been tried and found suitable for the manufacture of newsprints (Guha and Mukerji, 1961) and cooling pads (Jain and Hindoliya, 2011).
- Bright yellow to deep orange-red natural dyes derived from *B. monosperma* flowers are abundant and often utilized in the food and beverage pharmaceutical, silk, cotton, and leather industries. In contrast to the artificial and harmful Holi colors of the present day, natural colors made from these flowers continue to be produced in the region to Brij (Mathura, Uttar Pradesh).
- Lac cultivation: In India, butea-based lac manufacturing is quite popular, especially in places like Madhya Pradesh, Chhattisgarh, and Jharkhand. Additionally, this gives these states' rural impoverished and tribal people a very valuable source of income. Lac cultivation and *B.*

*monosperma* have a very close association. The farmer may earn more than 1200 to 1500 rupees from a single tree, which typically provides 1.5 to 2.5 kilogram of lac. However, efforts must be executed to promote *B. monosperma*-based lac farming, which would guarantee the preservation of *B. monosperma* species and the growth of rural livelihoods in addition to increasing lac production (Anuragi *et al.*, 2023). In Central India's drought-prone areas, lac production on *Butea monosperma*-based agroforestry is very beneficial for livelihood security. A single *Butea monosperma* tree may yield 1.5–2.5 kg, generating an annual income of Rs 700–800 (10–12 US\$) (Handa *et al.*, 2016).

### Conclusions

Palash-based agroforestry holds immense potential for sustainable development in India. By integrating this vibrant and ecologically significant tree into farming systems, farmers can achieve economic resilience while contributing to environmental conservation. But the vast potential remains largely under-exploited and many technologies are yet to be widely adopted. With the right support and awareness, Palash can transform rural landscapes, ensuring a balance between ecological health and economic prosperity. *Butea monosperma*-based agroforestry systems can contribute to rural development by providing income opportunities, improving food security, and enhancing ecosystem services. This approach can support sustainable agriculture and rural development. Promoting Palash agroforestry is not just an investment in rural livelihoods but also a step toward achieving India's goals of sustainable agriculture and climate resilience.

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