

Towards Viksit Bharat@2047 Technological Innovations and Policy Options for Eastern Region



ICAR Research Complex for Eastern Region

ICAR Parisar, P.O. Bihar Veterinary College
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Towards Viksit Bharat@2047: Technological Innovations and Policy Options for Eastern Region

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Agroforestry Models for Rehabilitation of Coal Mine Affected Areas in Eastern Plateau & Hill Region

Period of development: 2014 - 2023

Developers:

PK Sarkar, MK Dhakar, SS Mali, Bikash Das, SK Naik, Dharamjet Kherwar, DK Raghav, BP Bhatt

Background:

In the coal-rich state of Jharkhand, extensive mining activities have led to severe land degradation, rendering vast areas unfit for agriculture. With over 180 coal mines spanning approximately 6,377 km², deforestation, soil erosion, and contamination have disrupted traditional farming systems and local ecosystems. One such affected region is Phusri, a tribal village historically dependent on coal-based livelihoods. The villagers primarily engaged in quarrying and selling raw coal, as the degraded land offered little scope for farming. However, this unsustainable dependence on coal mining led to fluctuating incomes, environmental hazards, and a lack of alternative employment opportunities. Over time, soil fertility declined, water sources were contaminated, and the community faced socioeconomic instability, struggling to secure a sustainable future.

Description of the technology:

For transforming degraded coal mine lands, covering an area of 5 hectares the ICAR Research Complex for Eastern Region introduced an agri-horti-silvi-pastoral system in Phusri since 2015. To restore the barren land involved planting agroforestry species such as Bael (*Aegle marmelos*), Jackfruit (*Artocarpus heterophyllus*), Mango (*Mangifera indica*), Mahogany (*Swietenia mahogany*), Teak (*Tectona grandis*), and Bakain (*Melia azedarach*) at 150–200 trees/ha. Other species like Karanj (*Pongamia pinnata*), Guava (*Psidium guajava*), and Pomegranate (*Punica granatum*) were also included. Kans grass (*Saccharum spontaneum*) was planted as fodder between trees, providing 8-10 tons/ha/year, while Bhoomi Sudha (*Tephrosia candida*) was used as green manure and fodder, yielding 2.5–3 tons/ha/year. Intercrops were also introduced for additional income. However, caution is advised against cultivating food crops, especially fruits, due to their recorded tendency to absorb heavy metals like Arsenic, Cadmium, Chromium, Nickel, and Lead from the soil in these areas. Soil and water conservation measures included plastic-lined Dobha/Jalkund (3m × 1.5m × 1m) with a 4,500-liter capacity, and techniques like contour trenching (20 trenches/ha) and mulching. Zero tillage practices were also adopted. Regular field management and data analysis showed 85% tree survival rates and improvements in soil organic carbon by 0.5% over 9 years, helping to restore productivity and reduce soil erosion.

Commercial potential:

The technology can be offered through consultancy services or outsourced to the State Agricultural Department, Development agencies like Forestry Board, RKVY, NGOs, and farmers' groups. rehabilitating coal mine-affected areas effectively.



Impact of developed agroforestry models at coal mine affected areas

Impact:

Agroforestry interventions in coal mine-affected areas of Jharkhand have successfully restored degraded lands using Multipurpose Tree Species (MPTs) like Teak, Mahogany, and fruit crops, improving soil stability and biodiversity.

Agro-ecoregions suitability:

Jharkhand and other coal mine affected States

Reference:

Sarkar PK, Dhakar MK, Das B, Kumar PR, Maurya S, Mali SS, Shinde R, Choudhary JS, Naik SK, Kherwar D, Chakrabarti A, Raghav DK, Singh AK and Bhatt BP. 2019. Healthy plant: Foundation for nutritional and environmental sustainability. *LEISA INDIA*, pp. 6-10.