A SPECIAL IPC[1] WORKING PARTY ON COMMUNICATION AND OUTREACH (WP-COM) HIGHLIGHT SERIES:

'GLOBAL APPLICATIONS OF FAST-GROWING TREES IN AGROFORESTRY SYSTEMS'

Integrating Poplar in Rice-Wheat Farms

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Overview

The rice-wheat crop rotation is an important cropping system in most southeastern Asian countries because of its capability to ensure food security and provide means for livelihood. In India, the Green Revolution helped to increase the production of these two significant crops. However, over time, these crops heavily depleted the nutrient content of soils, contributed to the lowering of water tables, and increased the release of greenhouse gases into the atmosphere.

Diversification is perceived as the primary way to save the crumbling agricultural economy and the degraded environment of the original Green Revolution states in India. Agroforestry is a practical and feasible alternative land-use system that can enhance farm incomes and restore degraded natural resources, in addition to sequestering significant amounts of carbon.

Figure 1. a) Poplar boundary surrounding inter-cultivated rice, and b) employment generation through on-farm poplar cultivation.

Indian farmers have integrated fast-growing trees in agroforestry systems, which has been met with substantial market demand. Poplars are one type of fast-growing tree that has caught the attention of farmers due to their deciduous nature, slender crowns, fast growth, high market demand, and ease of cultivation (Fig. 1). Integrating poplars into agroforestry systems also permits the cultivation of agricultural crops, though there are environmental limitations for integrating poplars into wheat-rice paddy rotations. For example, while poplars are water-loving, they are sensitive to waterlogged conditions, and cannot survive in stagnant water. However, rice requires stagnant water for high productivity. Hence, poplar and rice are not a good combination, which has discouraged most small- and medium-farmers from integrating poplars into their farms.

[1]The International Commission on Poplars and Other Fast-Growing Trees Sustaining People and the Environment (IPC)

All photos by the authors.

Outcomes

Field observations have indicated that poplar-rice cultivation is possible if changes are made to cultivation methods (Fig. 2). For instance, growing poplars along boundaries rather than in blocks is a good option for integrating poplar with rice. A ratio of 1:3 block:boundary plantations of poplar facilitates the combination of poplar and rice. Studies have revealed that almost 64 percent of rice yield can be harvested when bordered by six-year-old poplar trees.

Figure 2. Major components of poplar-rice agroforestry systems in India.

Farmers can also plant poplars in blocks integrated with rice, provided the trees are grown on raised beds at wider row-to-row spacing that prevents poplar root systems from being immersed in stagnant water. Stagnant water not only negatively affects poplar root systems, but also causes the trees to tip over. Poplars can be integrated with rice within block plantations on raised beds at regular spacings, but only for an initial two years, with around 70 to 75 percent crop yield.

Direct seeding is the third option for cultivating rice in farms with poplar trees. This method requires 37 to 40 percent less water than transplanted rice. Direct seeding of rice is labor efficient, often yielding ± 5 to 6 percent yield versus transplanted rice.

Keywords: Indian agroforestry, poplar-rice cultivation, fast-growing trees

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