Improvement in agroforestry system (To be cited as: Sarkar, P.K., Bishnoi, S.K., Shinde, R. and Das, B., 2017. Improvement in agroforestry system. Indian Farming, 67(07): 19-20)

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Improvement in agroforestry system

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Agro-forestry systems of Jharkhand are homestead garden, agro-silvicultural system, including scattered trees like acacia, palas, mahua *etc. on agriculture fields. Farmers are facing challenges owing to insufficient understanding of market structure of agro-forestry products which is a big hurdle in ensuring remunerative price to them. Our study showed that there is need of improved agro-forestry models.*

Key words: Agro-forestry system, Improvement

Bamboo-based agroforestry system

Mango-based system improved technology for farmers of Jharkhand

Traditional agroforestry system; plantation on field bunds

AMONG various states of Eastern India (Eastern Uttar Pradesh, Bihar, Jharkhand, Odisha, Chhattisgarh, West Bengal and Asom), Jharkhand has the highest area under wastelands/degraded lands (14.84%), followed by Asom (11.20%) and Odisha (10.69%). There is a need to restore those wastelands/degraded lands through agroforestry interventions to supply the increasing demands of food, fuel, fodder and timber requirements of rural folks in Jharkhand. Thus agroforestry serves as one of the option to tackle the problems of resource degradations and its over exploitation in this state.

The traditional agroforestry systems have three to four vertical strata, the upper most strata consists of timber trees *viz., chakundi, bakain, gamhar, karanj, shisham, mahua, teak* etc., in the next strata the fruit trees like tamarind, jackfruit, litchi, mango, aonla, etc. are present. The third strata consists of banana, citrus, papaya, etc. and in the lowest strata vegetables (tomato, chilli, turmeric, onion, ginger, yam, etc.) are taken for utilization of all the available natural resources. Under higher elevations of Jharkhand, agri-horticultural systems with fruit plants in field bund is a common practice. Now-a-days, farmers have started cultivating fast growing tree species like gamhar, bakain, *karanj*, *semul*, *khair*, etc. in a scattered or in lines or on bunds or in the boundaries of the annual crops like paddy, niger, maize, millet, cow-pea, pigeonpea, etc. for marginal/ wasteland of the state. In silvipastoral system, planting of fodder producing trees (Melia, Gamhar, Ficus, ber, neem, subabul, etc.) for improving the carrying capacity of the pasture/ grazing land have also been found.

The species (*Pongamia pinnata, Acacia catechu, Pterocarpus marsupium, Madhuca integrifolia, Azadirachta indica, Sapindus mukorossi, Emblica officinalis, Gmelina arborea, Dalbergia latifolia* and *Albizia procera*) are traditionally grown by the farmers of Jharkhand. Bakain (*Melia azedarach*), teak (*Tectona grandis*) and gamhar (*Gmelina arborea*) based agroforestry systems are common in their farm land and even found to be suitable to grow on degraded/wastelands. Some of traditionally grown forest tree species and their uses are discussed in Table 1.

Bamboo-based agroforestry systems are also found very common in Jharkhand. Among the bamboo species *Dendrocalamus strictus, Melocaena baccifera, Bambusa arundinacea, B. tulda* and *B. balcooa* are the common in traditional boundary plantation. Bamboo shoots are consumed as vegetable by the tribals which is one of the important

sources of income for them. Sericulture is also an important source of income for tribal farmers in Jharkhand. Now-a-days, inter-cropping of mulberry (*Morus alba* L.) with pea and French bean in rainfed areas, particularly in Chotanagpur Plateau is in practice.

In eastern India, water-logging and salinity is one of the most wide spread problems. Agroforestry plays a vital role in rehabilitation of water-logged and salinity affected areas by the agroforestry interventions where agroforestry species act as a biodrainage system, where the excess soil water gets drained out by deep rooted plants through the process so called bio-energy. The fast growing trees and trees with deep tap root systems should be selected for effective

management of such areas. Many fast growing species like *Dalbergia sissoo*, *Eucalyptus* spp., *Pongamia pinnata*, *Syzygium cuminii*, *Terminalia arjuna*, etc. are found to grow in the water-logged conditions in Jharkhand.

Hence, traditional agroforestry systems of Jharkhand are providing sustainable benefits to the native farmers in terms of earning their livelihood. However, there are few challenges the farmers face due to insufficient understanding of market structure of agroforestry products which is a major hurdle in ensuring remunerative price to them. There is a need for more involvement of corporate and farmers cooperatives in this sector who can guide them, disseminate the novel technologies and various location specific improved agroforestry models. Also, there is a need to identify the plus trees or candidate trees based on selection of best phenotypes for further multiplication in a large-scale and to make available the quality planting stock.