

Agroforestry: A new dimension in crop diversification

Puneet Kaur* and Preksha

Department of Agronomy,

Punjab Agricultural University, Ludhiana

Corresponding author: pk641619@gmail.com

ARTICLE ID: 022

Introduction

The success of green revolution made India self-sufficient in food production. This self-sufficiency was achieved mainly due to cereal based cropping systems in various agro-ecological regions. Rice-wheat cropping system is one such major system adopted across the Indo-Gangetic plains of India. Intensive cereal based cropping systems led to the gain in production nevertheless degrading resource base poses a question to the sustainability of such systems. Various regions in north-west India which were at the forefront of green revolution are now facing serious air, water and soil quality issues. Due to various ecological and environmental issues, such energy and water-intensive systems demand a paradigm shift. Adoption of resource conserving technologies is advocated for sustaining the productivity gains however for a holistic development, sustainable utilization of land becomes important. Fulfilling the food needs of anticipated 9.3 billion people by 2050 requires 60 % expansion in production (FAO, 2017). This global food demand and supply challenge, combined with the current issues emerging from non-sustainable land use practices, proposes the need to change the manner in which we oversee our lands, tree component and production of crops. In order to address these concerns, crop diversification *i.e.* moving from the traditionally grown crops to other economically viable and high value crops, is assuming importance. Crop diversification through agroforestry can play a key role in maintaining ecological balance and sustaining food production, besides raising the country's tree cover from 24.56 % (FSI, 2019) to 33.33 % in line with the National Forest Policy (1988).

Crop Diversification through Agroforestry

Agroforestry is picking up prominence among the farmers with a choice of expanding their farm productivity with higher profitability. Growing of trees with crops provide a viable option with opportunities to diversify as well as increase overall land productivity.

Agroforestry is a land use system where woody perennials are deliberately grown on the same land management unit as agricultural crops and animals, either in some form of spatial arrangement or on a temporal sequence. Currently practiced on 25.32 million hectares of land, agroforestry is considered as a panacea of intensive agriculture's challenges like declining soil fertility and coping with changing climate. Agroforestry based systems supply half of the demand of fuelwood, two-thirds of the small timber, 70–80 % wood for plywood, 60 % raw material for paper and pulp, 9–10 % of green fodder besides meeting the subsistence needs of households (Dhyani *et al*, 2013).

Suitable agroforestry trees of India

With the potential for adoption to much larger areas, selection of suitable tree species and crops with high yield potential are important aspects in tree-crop intercropping systems. The most common agroforestry tree species grown in India are *Populus deltoides*, *Eucalyptus tereticornis*, *Acacia nilotica*, *Dalbergia sissoo*, *Azadirachta indica*, *Bombax ceiba*, *Cocos nucifera* etc. Tree species viz. *D. sissoo*, *A. indica*, *A. nilotica*, *Grewia optiva*, *Morus alba*, *Ficus* spp. are grown on the boundaries of fields for meeting demand of timber, fodder, fuel etc. Amongst the fast growing tree species, poplar is a preferred tree in agroforestry. This is due to its straight bole, small crown and winter deciduous nature that allows winter cropping with only marginal negative effect on crop yields (Gill *et al*, 2009). Area under poplar-based agroforestry which is estimated to be 3.12 lakh ha in states of Punjab, Haryana and Western Uttar Pradesh, is steadily increasing (Singh and Kumar, 2014). This tree species has been extensively experimented with annual and seasonal crops in north-western India, comprising Punjab, Haryana, Uttar Pradesh, Uttarakhand, lower parts of Himachal Pradesh and Jammu and Kashmir. However, *Eucalyptus* and *Melia* have the potential of being promising agroforestry tree species in these regions. Poplar and *Melia* being winter deciduous trees, crops grown under these species perform better than under eucalyptus.

Ecosystem services and agroforestry

Since the industrial revolution, atmospheric CO₂ level has accelerated and is predicted to increase further e.g., the CO₂ concentration in atmosphere has reached up to 413.59 ppm on November, 2020 from 409.8 ppm in 2019. Globally, more than 70 countries have identified agroforestry as one of the important tools for carbon sequestration. Agroforestry systems sequester atmospheric carbon in plant biomass and in soils. Agroforestry practices also

improve soil and water conservation, soil biodiversity, and improve water quality by reducing the chemical pollutant levels in water. The biomass added through pruning materials, leaf litters and root residues adds nutrients and organic matter to the soil thus improving soil condition and increasing the crop productivity.

Conclusion

Agroforestry provides an option to bring prosperity for farmers and rural people by generating employment; ensuring food and nutritional security; meeting the other basic human needs on the sustainable basis and cushioning farmers from the harshness of climate change. Agroforestry systems create an integrated, diverse, productive, profitable, healthy and sustainable land use system and are an option to increase the country's forest and tree cover to the target of 33 %.

References

- Dhyani, S.K., Handa, A.K. and Uma. (2013). Area under agroforestry in India: An assessment for present status and future perspective. *Indian Journal of Agroforestry*. 15 (1):1–11.
- FAO. (2017). Agroforestry - food and agriculture organization of the United Nations. <http://fao.org/forestry/agroforestry/en/>.
- FSI. (2019). India State of Forest Report 2019, Forest Survey of India, Dehradun: pp 21-105.
- Gill, R.I.S., Singh, B. and Kaur, N. (2009). Productivity and nutrient uptake of newly released wheat varieties at different sowing times under poplar plantation in north-western India. *Agrofor Syst*. 76:579-90.
- Singh, A. and Kumar, A. (2014). Critical issues in poplar-based agroforestry system. *Indian Journal of Agroforestry*. 16 (1):58–67.