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ABSTRACT

To achieve biological production on a sustainable basis through the addition of soil organic carbon (SOC) and check land degradation, *Populus deltoides* is a promising species recognized as an important tree component in agroforestry system (AFS) in the present changing climate. The soil is enriched through the addition of leaf litter in large quantities by this tree, which ultimately improves the fertility in terms of SOC, available N, P and K. However, scanty information is obtainable related to associations between soil properties and poplar based AFS. In this communication, the objective of this study to examine the effect of three old poplar based AFS on soil OC, available N, P and K. The site consisted of six different spacings: i.e. 3×3m, 4×3m, 5×3m, 6×3m, 7×3m and 8×3m of poplar were intercropped with winter wheat, and in adjacent agricultural control plot, where winter wheat was the sole crop (devoid of tree). We quantified soil properties such as soil SOC and available N, P and K at 0-15 cm depth and studied their spatial variability in relation to different spacings of poplar based AFS during 2018-2019. SOC accumulation rates increased with the decrease in tree spacing and were maximum (0.69%) under 3×3 m spacing. The available soil N, P and K increased significantly under different spacings of poplar based AFS in all the treatments from their initial values. The highest available soil N (233.5 kg ha⁻¹), P (16.1 kg ha⁻¹) and K (285.3 kg ha⁻¹) were recorded under 3 × 3m spacing compared to 4×3m, 5×3m, 6×3m, 7×3m, 8×3m and sole cropping after harvesting of wheat crop.

Introduction

To combat land degradation and achieve biological production on a sustainable basis, *Populus deltoides* is a promising species recognized as an important tree component in agroforestry system. Due to its fast growth, high price, less competition with associated crops this species has been grown by farmers in Northern India as boundary or block plantation along with agricultural crops.

Objective

To determine soil properties such as SOC and available N, P and K under poplar based AFS.



3m × 3m



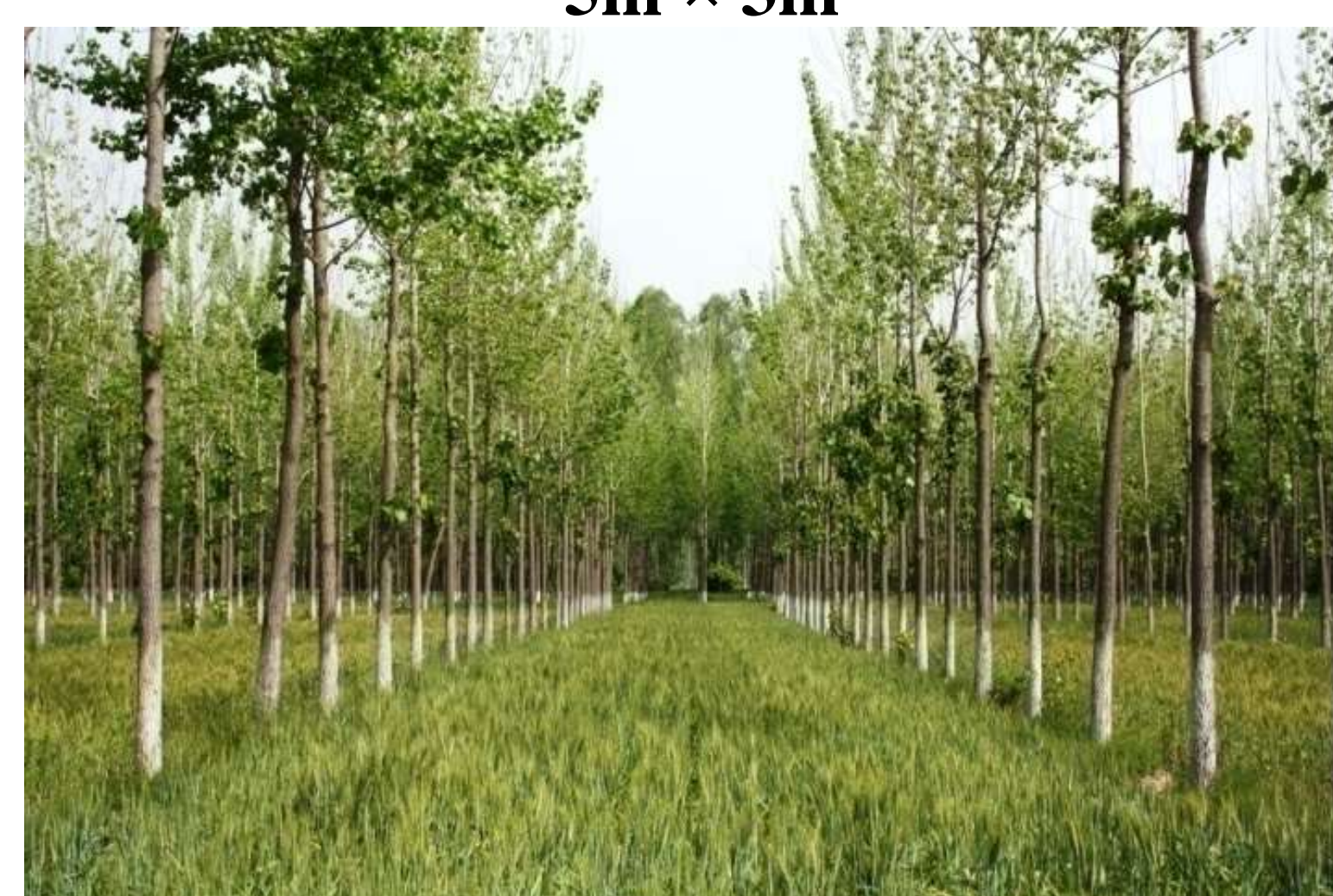
4m × 3m



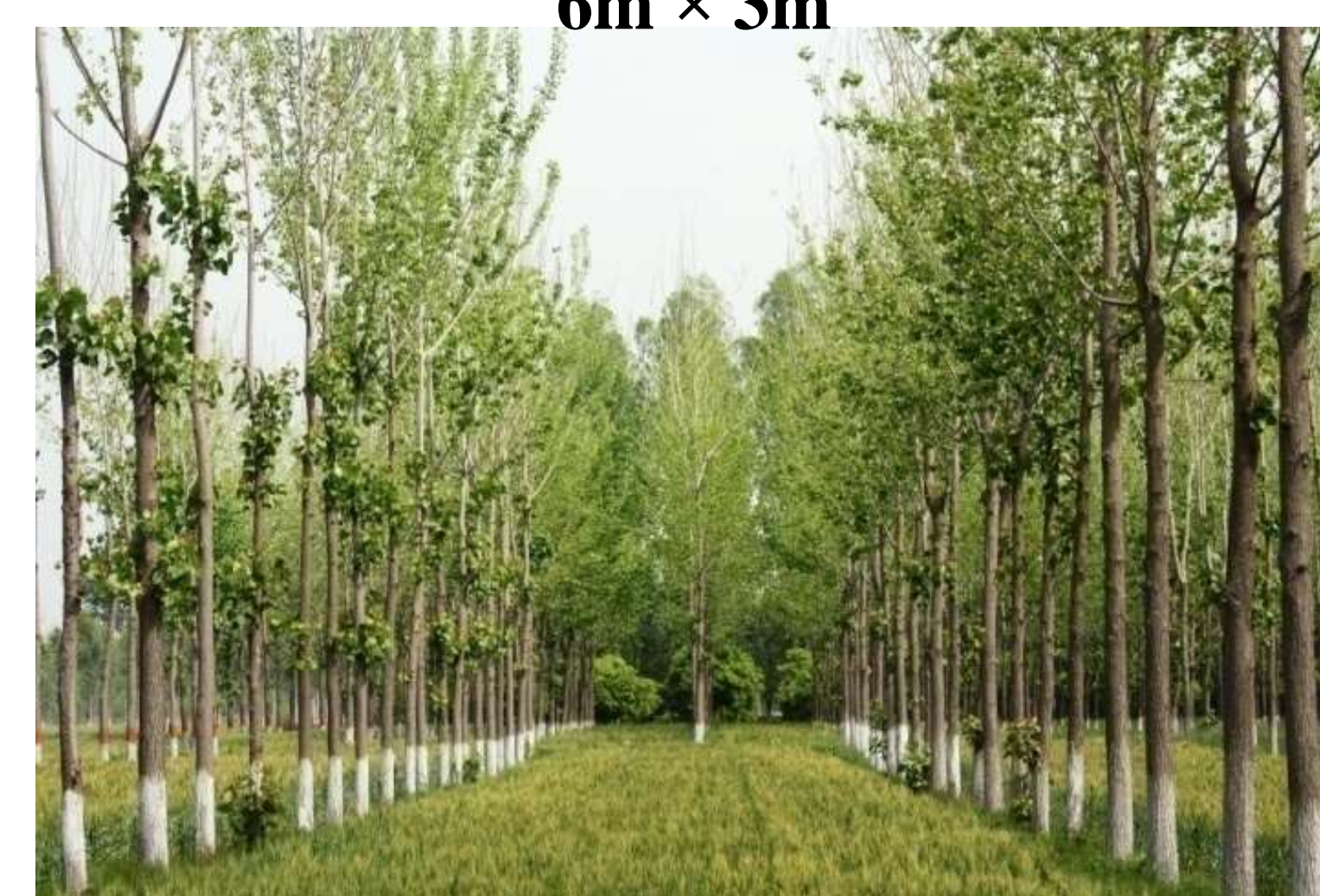
5m × 3m



6m × 3m



7m × 3m



8m × 3m

Results

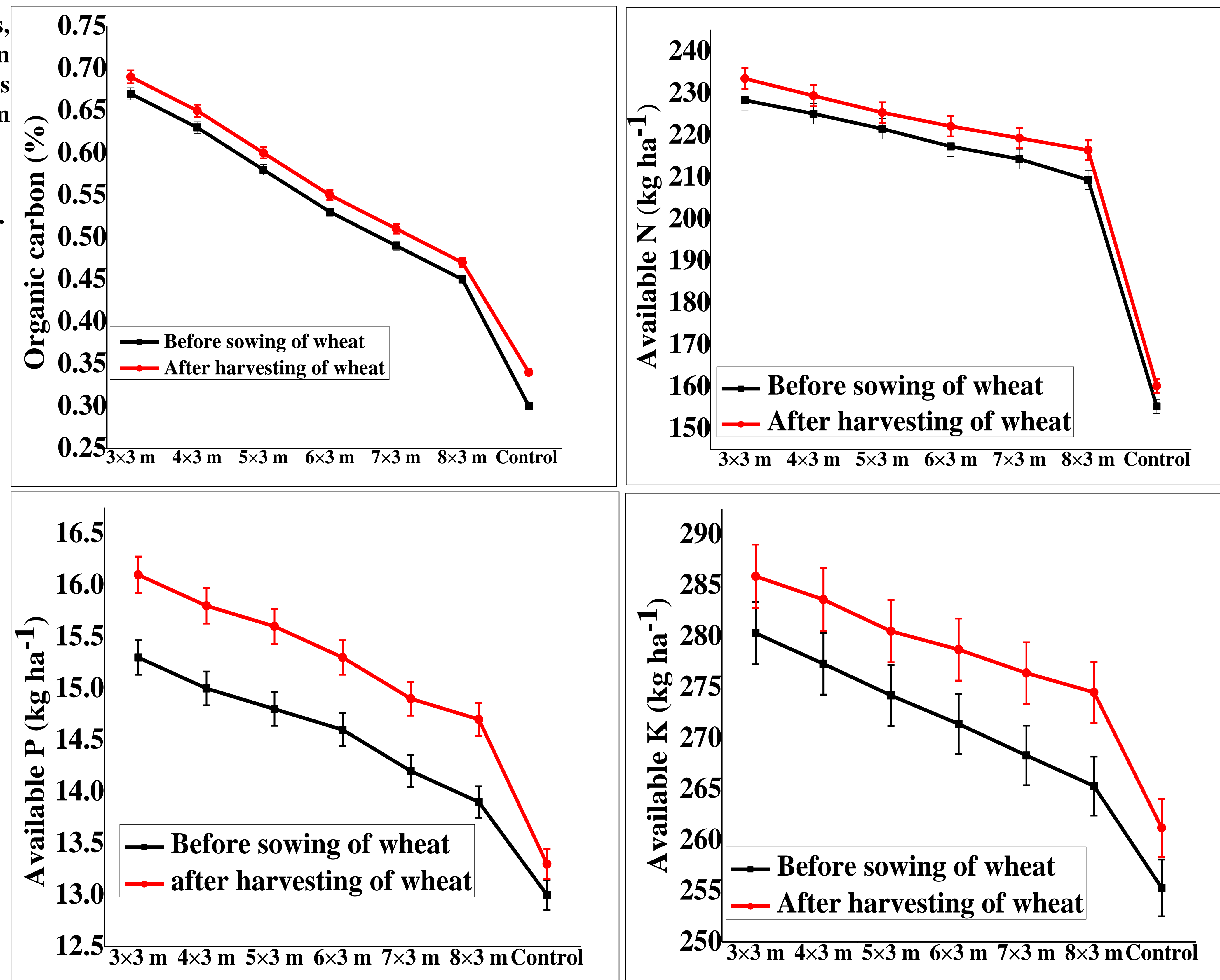


Fig 1. Effect of different spacings of three year old poplar plantation on SOC, available N, P and K (kg ha⁻¹)

Conclusion

After 3 years of poplar plantation, the highest available soil organic carbon, N, P and K were recorded under 3×3m spacing of poplar based AFS compared to sole cropping after harvesting of wheat crop. Therefore this spacing was more suitable for improving soil fertility by the accumulation of leaf litter with the advancement of tree age.