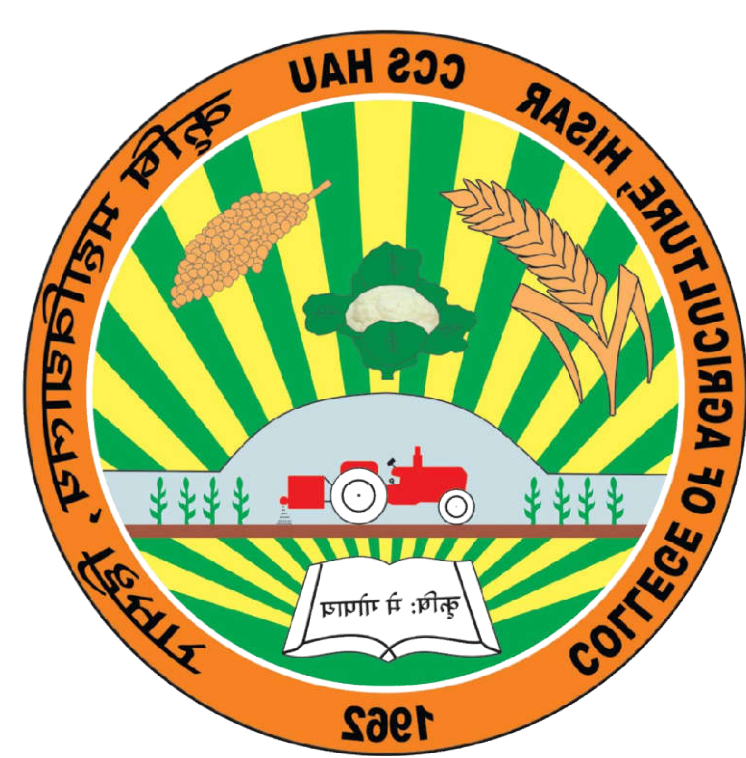




# Soil properties and moisture status under various spacings of poplar based agroforestry system in Northern India

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## Introduction

The increasing deforestation for human habitation, developmental activities and intensive agriculture has resulted in ecological imbalance. As a result, need has been realized for conservation of natural resources and protection of the deteriorating environment so that the required growth in agriculture is maintained with sustainability<sup>1</sup>. To combat land degradation and achieve biological production on a sustainable basis, poplar (*Populus deltoides*) is a promising species recognized as an important tree component in agroforestry system<sup>2</sup>. Due to its fast growth, high price, less competition with associated crops and pruning tolerant nature this species has been grown by farmers in Northern India as boundary or block plantation along with agricultural crops.

## Methodology

- *Populus deltoides* (G-3 clone) was planted in three spacing geometry of compact block (5×4m), wider (10×2m) and paired row (18×2×2m) at a constant density of 500 trees ha<sup>-1</sup> during 2008.
- Soil samples were taken to determine soil moisture content and soil properties such as soil organic carbon (SOC) and available N, P and K at 0-15 and 15-30 cm depths under different spacings of poplar based AFS.

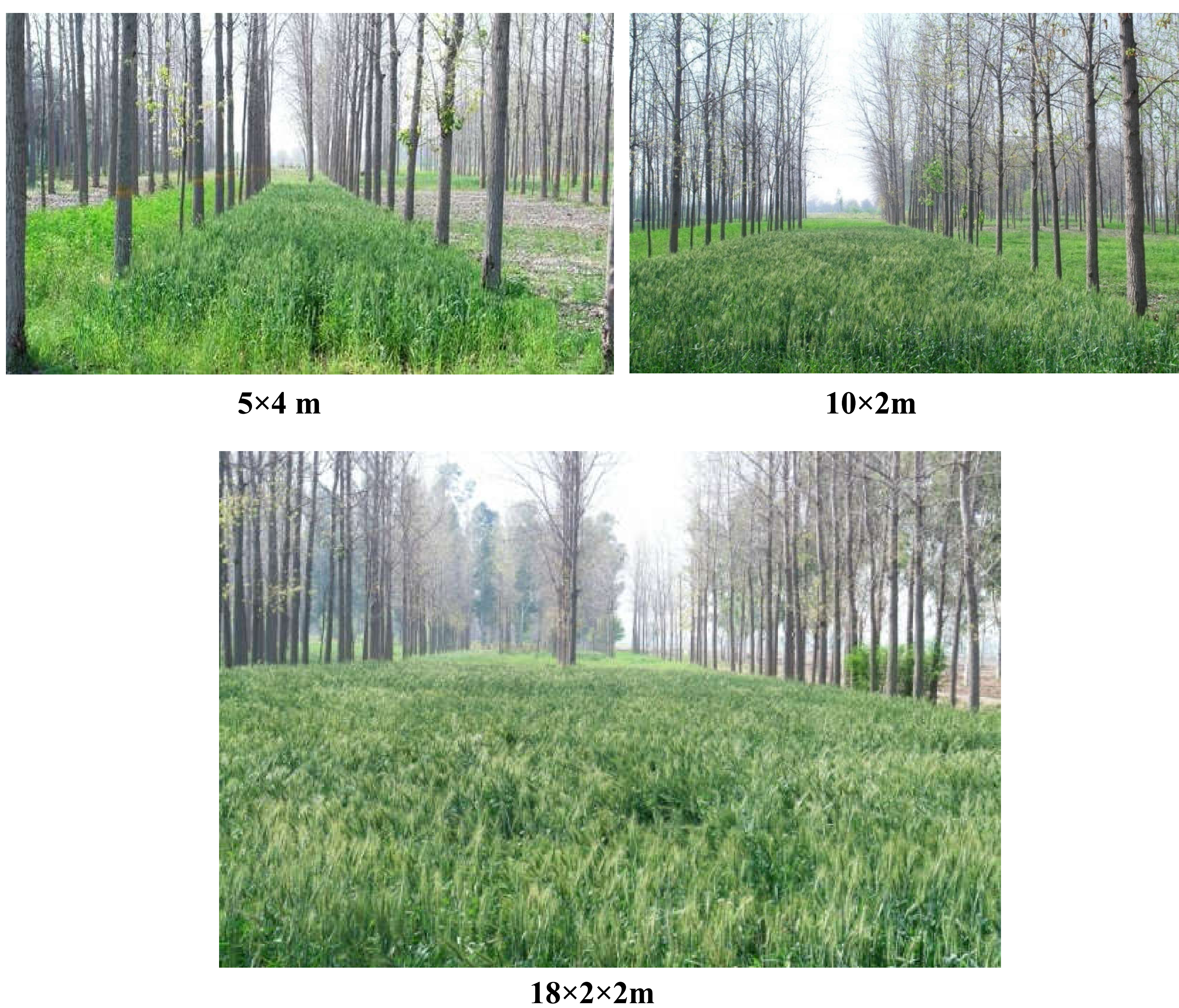


Plate 1: Leaf fall in 8 years old poplar under different spacings

## Results & Discussion

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 (366.3 kg ha<sup>-1</sup>), P (21.4 kg ha<sup>-1</sup>) and K (355.3 kg ha<sup>-1</sup>) were recorded under 5 × 4 m spacing. Among all the spacings of poplar based AFS, the maximum moisture content (13.3%) was found in 5 × 4 m spacing at a soil depth of 15-30 cm which was closely followed by 10 × 2 m (12.4%) before 1st irrigation (pooled data).

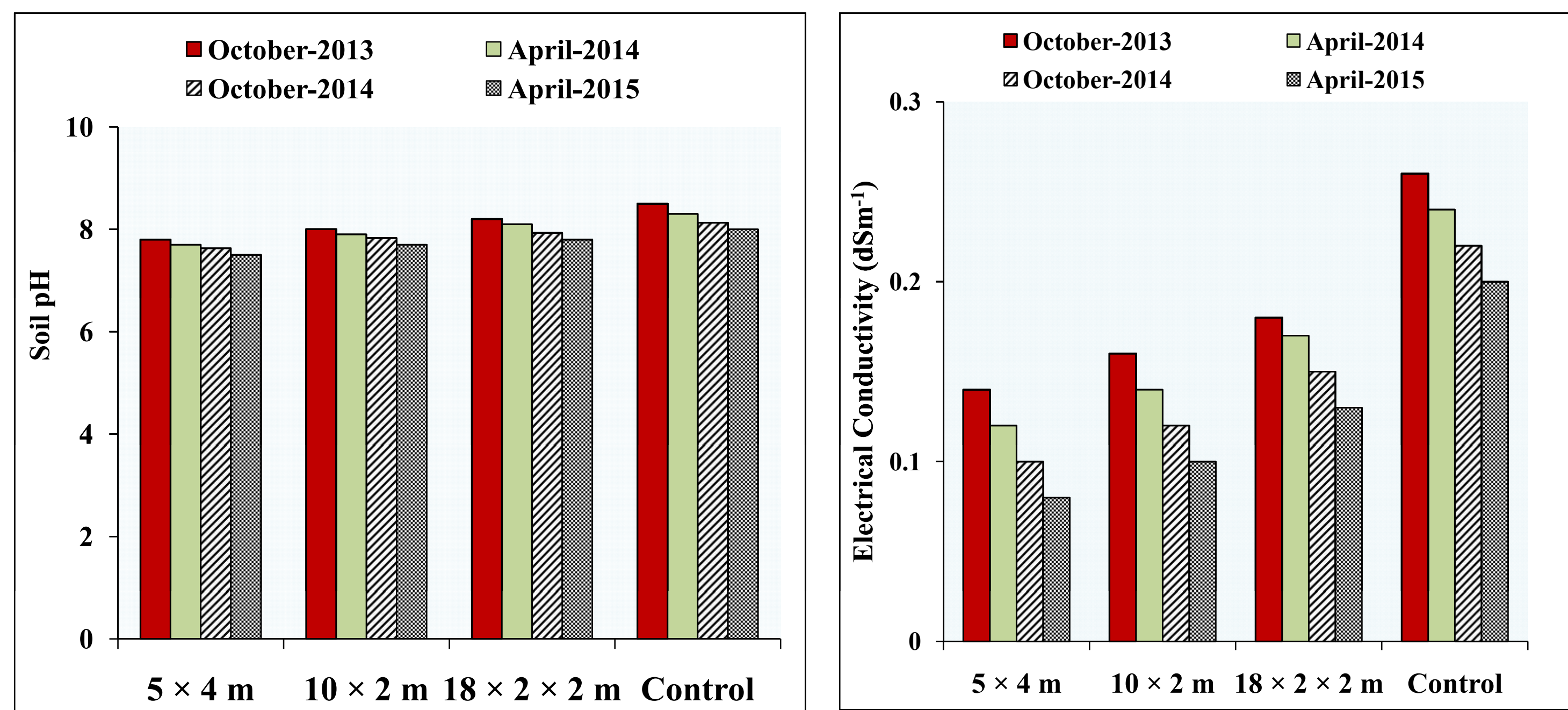


Fig 1. Effect of different spacings of 7 and 8 years old poplar plantation on Soil pH and electrical conductivity (dSm<sup>-1</sup>) before sowing and after harvest of wheat crop during 2013-14 and 2014-15

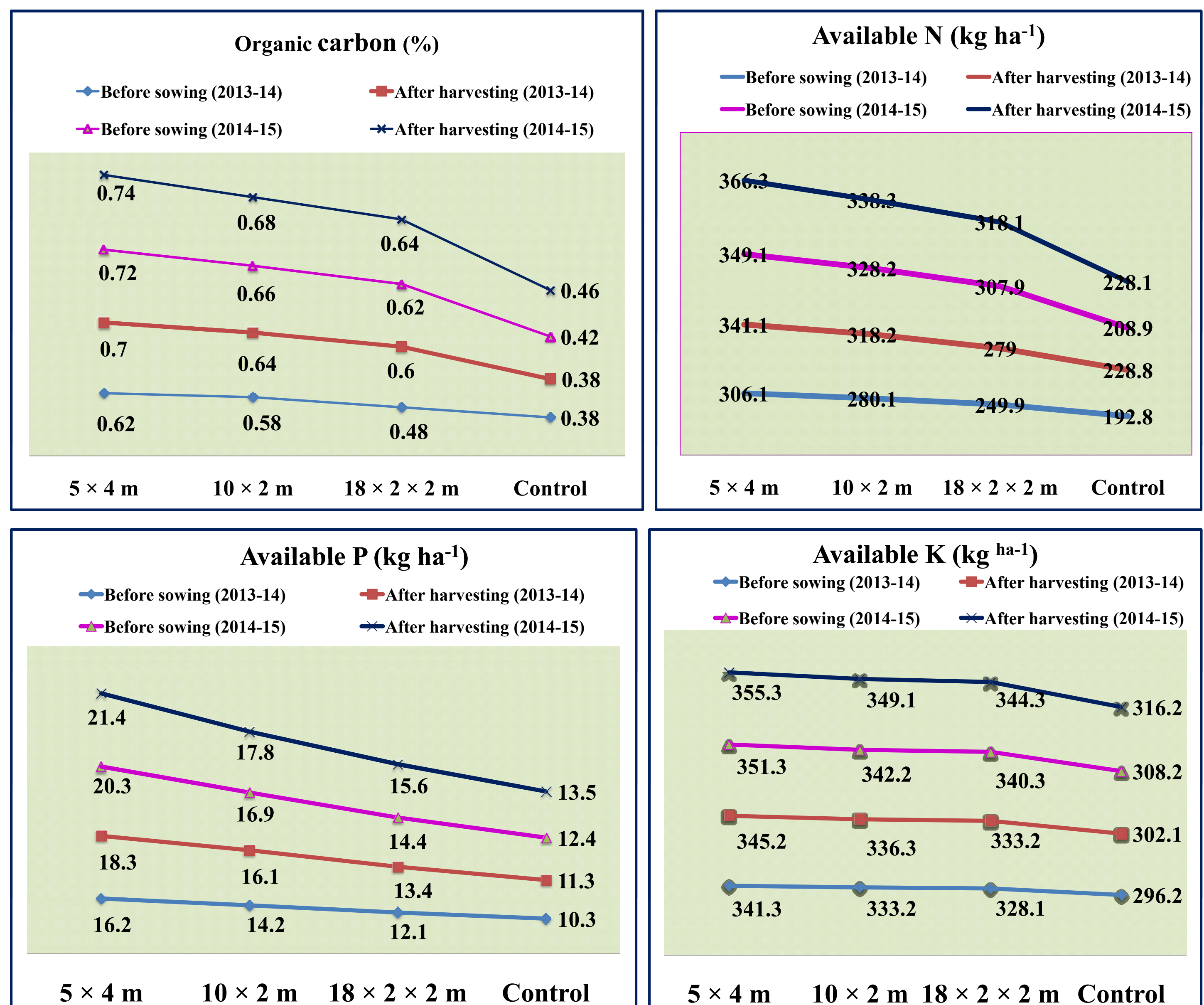


Fig 2. Effect of different spacings of 7 and 8 years old poplar plantation on soil organic carbon (SOC), available N, P and K (kg ha<sup>-1</sup>)

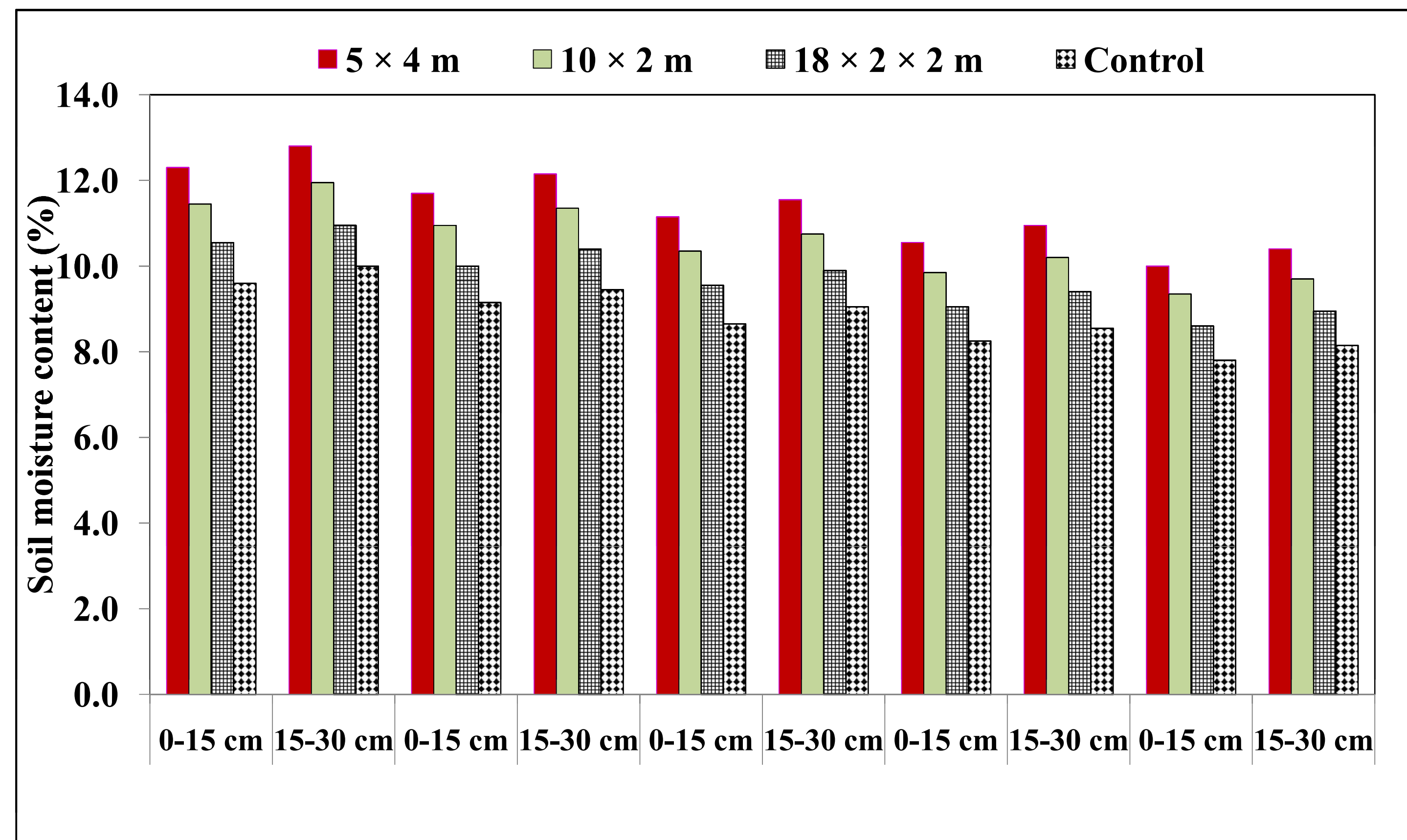


Fig 3: Effect of different spacings of 7 and 8 years old poplar on soil moisture content (%) at various soil depths (cm) during wheat growing season

## Conclusion

- After eight years of poplar plantation, physico-chemical properties of soil (SOC, N, P and K) had improved under different spacings of poplar-based agroforestry system. The moisture content was also higher under different spacings of poplar as compared to control during the period of study. The effect was more pronounced under 5×4 m spacing; therefore this is more suitable for improving soil fertility and moisture by the accumulation of leaf litter with the advancement of tree age.

## References

1. Chauhan, S. K., Brar, M. S. and Sharma, R. 2012. Performance of poplar (*Populus deltoides* Bartr. Ex Marsh) and its effect on wheat yield under agroforestry system in irrigated agro-ecosystem, India. *Caspian J. Environ. Sci.*, 10(1): 53–60.
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