



AGGP-Agroforestry

# GREENHOUSE GAS GRADIENTS FROM A SHELTERBELT TO THE CENTER OF AN ADJACENT CROPPED FIELD

## No. SASK-18

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Recent studies suggest that shelterbelts play a significant role in storing atmospheric carbon in the soil and in mitigating the emissions of greenhouse gases (GHG) from agricultural activities (Fig 1). Also, shelterbelts have measurable effects on soil properties and crop yield at various distances away from the shelterbelt strip attributed mainly to tree root effect and shelterbelt influence on soil micro-



Fig. 1. Shelterbelts play a role in carbon storage and greenhouse gas mitigation

climatic conditions. However, there is a lack of data on the effect of shelterbelts on soil GHG exchange at various distances away from the shelterbelt, given the linear structure of shelterbelts on the landscape.

### EXTENT OF THE SHELTERBELT EFFECT

During 2013 and 2014, changes in CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions along a transect from a 33-year-old, two-row hybrid poplar-caragana shelterbelt were studied within the parkland region of Saskatchewan Canada, using steady-state vented chambers. Gas samples were collected along parallel transects situated at the shelterbelt strip (0H), shelterbelt edge (0.2H), at the edge of the adjacent cropped field (0.5H) and in the cropped field at distances of 40 m (1.5H) and 125 m (5H) from the shelterbelt.

### Major Findings

- Summed over the entire study period, soil N<sub>2</sub>O emissions were lowest at 0H (345 ± 15 g N<sub>2</sub>O-N ha<sup>-1</sup>) but increased with increasing distance from the shelterbelt (Fig 2).

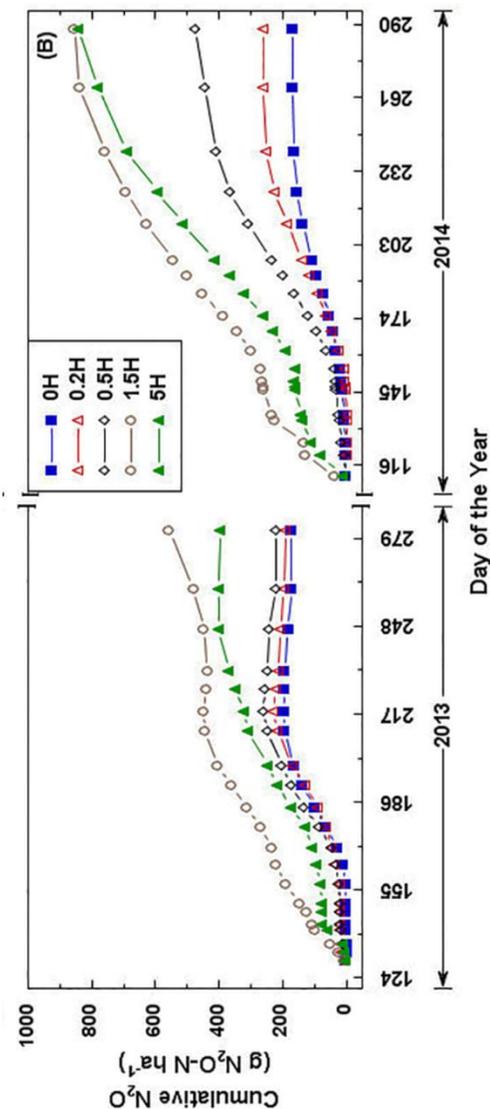


Fig. 2. Cumulative N<sub>2</sub>O emissions (g N<sub>2</sub>O-N ha<sup>-1</sup>) measured along replicate (n = 5) transects extending from the center of the shelterbelt (0H) to the center of the adjacent cropped field (5H) in 2013 and 2014.



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- Methane production in the soil was lowest in the shelterbelt at 0H ( $-1447 \pm 216$  g  $\text{CH}_4\text{-C ha}^{-1}$ ), but increased as distance from the shelterbelt increased. (Fig. 3).
- Both soil organic carbon and soil respiration were greatest in shelterbelt strip, but decreased with distance from the shelterbelt. However, the decrease in soil carbon and  $\text{CO}_2$  emissions at increasing distances away from the shelterbelt was irregular, with soil temperature and soil organic carbon distribution being the dominant controls.

### FURTHER READING

- Amadi, C.C., K.C.J. Van Rees, R.E. Farrell. 2016. Soil – atmosphere exchange of carbon dioxide, methane and nitrous oxide in shelterbelts compared with adjacent cropped fields. *Agric., Ecosyst. Environ.* 223:123–134
- AGGP Fact Sheet(s): SASK-17, SASK-19

CONTACT FOR MORE INFORMATION: [SASKAGROFORESTRY.CA/](http://SASKAGROFORESTRY.CA/)

### ACKNOWLEDGEMENTS & COPYRIGHT

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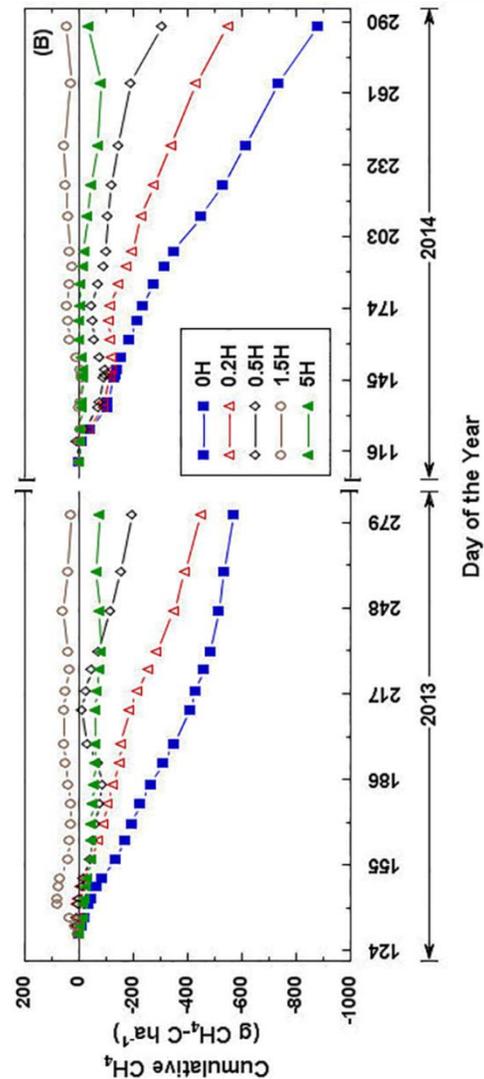


Fig. 3. Cumulative  $\text{CH}_4$  exchange ( $\text{g CH}_4\text{-C ha}^{-1}$ ) measured along replicate ( $n = 5$ ) transects extending from the center of the shelterbelt (0H) to the center of the adjacent cropped field (5H) in 2013 and 2014.

