Farmland Hedgerows

Findings from the Farm-scale Delta, BC Hedgerow Study

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Hedgerows are trees, shrubs and grasses bordering the edges of farm fields that can provide key ecosystem services in agricultural landscapes. Ecosystem services are those functions of the ecosystem that benefit humans. Examples include providing habitat for pollinators, the regulation of water and climate. The Delta Farmland & Wildlife Trust (DF&WT) has worked to plant hedgerows on farmland in the Lower Fraser River Delta since 1995 to improve the availability of ecosystem services. In 2013-2014 DF&WT in collaboration with the Sustainable Agricultural Landscape Laboratory at the University of British Columbia (UBC) quantified the availability of some key ecosystem services for two types of hedgerows found in the delta.

Mitigating Climate Change

An ecosystem service that can be provided by hedgerows in agricultural landscapes is the regulation of climate. As the trees and shrubs found in hedgerows grow, they store carbon in their branches and roots. When their leaves fall to the ground as litter, they contribute to storing carbon in the soil. Storage of carbon can mitigate or lessen the impact of climate change[1]. Analysis of the mitigation potential of two types of hedgerows (page 2) found in Delta, BC shows that despite different carbon storage distribution, their total storage is the same (Figure 1). Measuring greenhouse gas (GHG) emissions from hedgerows is another important component to understanding their mitigation potential[2]. One year of emissions monitoring shows that there are differences between hedgerows and production fields (Figure 2) but further research is needed to fully understand implication of these results.

GHG Emissions:

Not all gases are equal

Carbon dioxide (CO_2) is the most commonly referenced greenhouse gas. Others gases such as nitrous oxide (N_2O) and methane (CH_4) are typical of agricultural production and are 298 and 25 time more powerful than CO_2, respectively.

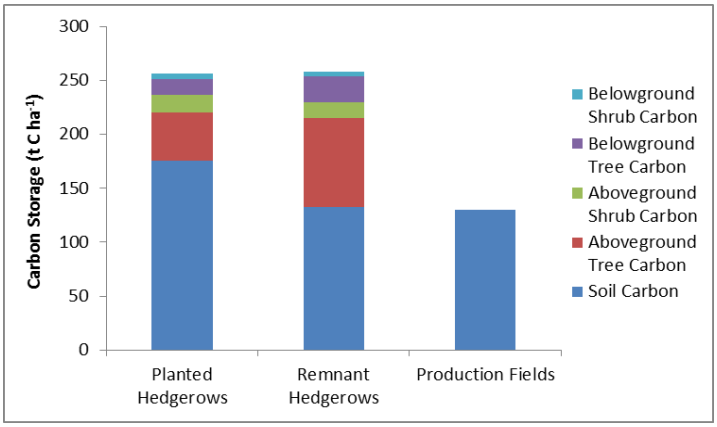

Figure 1. The total carbon storage from the trees, shrubs and soil in planted and remnant hedgerows is comparable.

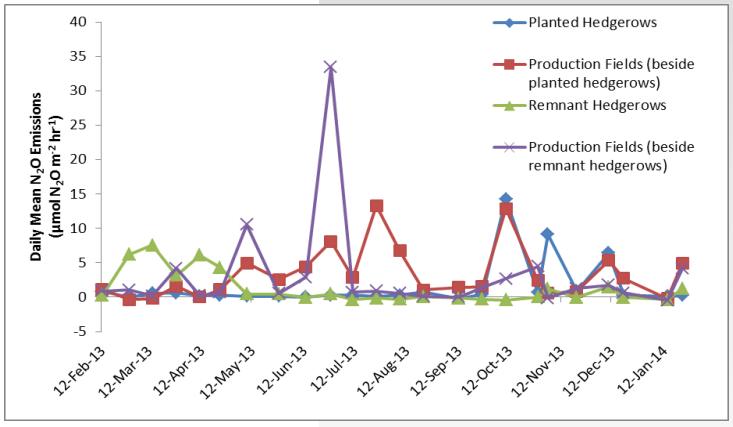

Figure 2. CO_2, N_2O and CH_4 emissions were measured for a year. Here N_2O emissions show variability throughout the year (temporal) and also between the four land use categories (spatial).

For more information about the Hedgerow Stewardship Program or the research on hedgerows see: http://www.deltafarmland.ca/; http://sal-lab.landfood.ubc.ca/

"Hedgerow Benefits & the Delta, BC Hedgerow Project"

"Findings from the Farm-scale Analysis of the Delta, BC Hedgerow Study"

"Findings from the Landscape Analysis of the Delta, BC Hedgerow Study"

Delta Farmland & Wildlife Trust

Types of Hedgerows in the Lower Fraser River Delta

"Planted Hedgerows": Hedgerows established by the DF&WT; age 9-19 years; average width 4 m

"Remnant Hedgerows": Hedgerows already established before the DF&WT; age 30-50 years; average width 7.5 m

Soil Structure

Soils have a number of structural forms or aggregates arrangements. These aggregates are clumps of mineral particles and organic matter that vary in size. Soil stability is the ability of aggregates to resist a disturbing force. Production fields have lower aggregate stability, measured by the mean diameter of the aggregates (Figure 3), compared to hedgerows because they are disturbed by farm equipment.

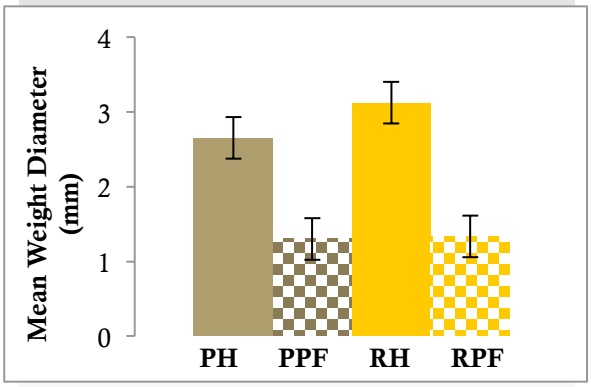

Figure 3: Soil aggregate stability of hedgerows (PH and RH) is greater than that of production fields (PPF and RPF).

Improving Soil Quality

The quality of a soil can affect how long carbon is stored or how water infiltrates or is stored. Soil quality also impacts plant growth, soil air movement, nutrient retention and microorganism habitat. Measuring soil quality using an indicator such as aggregate stability, we get better understand the processes taking place.

- **Soil aggregate sizes** impact pore size distribution, air and water movement, and root growth.
- **Pore sizes.** Aggregates allow for the creation of pore spaces in the soil, which range from very small (within aggregates), medium, and large (between aggregates). Pores allow for air and water movement.
- **Habitat.** Pores are also the spaces in which microorganism live. Theses organisms perform a number of important functions including the decomposition of organic matter.
- **Protect carbon.** Aggregates protect carbon within their structure to prevent it from being decomposed for long periods of time [3].

References:

[1] Smukler, S. M., et al. (2010). Biodiversity and multiple ecosystem functions in an organic farmscape. *Agriculture, Ecosystems & Environment*, *139*(1-2), 80–97.

[2] Six, J. (2000). Soil Structure and Organic Matter : I . Distribution of Aggregate-Size Classes and Aggregate-Associated Carbon. *Soil Science Society of America Journal*, *64*, 681–689.

[3] Falloon, P., Powlson, D., & Smith, P. (2004). Managing field margins for biodiversity and carbon sequestration: a Great Britain case study. *Soil Use and Management*, *20*(2), 240–247.

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