Date: 02 November 2023

Standing Senate Committee on Agriculture and Forestry

Response prepared by Raju Soolanayakanahally, Research Scientist, Agriculture and Agri-Food Canada

Question 1: How is agroforestry practiced throughout Canada?

Response: Agroforestry is practiced in a variety of ways in Canada, with implementation varying according to region, climate, and the specific goals of landowners. In Canada, agroforestry systems frequently aim to integrate trees and woodlands with agricultural or other land uses to achieve multiple benefits such as increased sustainability, biodiversity, and productivity. Agriculture and Agri-Food Canada has a long and distinguished history of supporting strategic tree planting in the agricultural landscape.

Here are some common agroforestry practices in Canada:

- **Shelterbelts:** Shelterbelts (also known as windbreaks) are widely used agroforestry practices in Canada, particularly on the prairies (Alberta, Saskatchewan, Manitoba, and the Peace River region of British Columbia) and in the Great Lakes region. Shelterbelts are rows of trees or shrubs planted around or within fields and livestock facilities to protect crops and livestock from wind and snow accumulation while also improving biodiversity. In 2019, Canada's agricultural landscape covered 158.7 million acres (StatsCan), with 1.7 million acres planted to shelterbelts. Shelterbelts have been shown to increase adjacent crop yield by altering the microclimate. In addition to carbon sequestration, shelterbelts provide critical semi-natural habitats for pollinators and other beneficial insects, birds, mammals, and other wildlife within large regions of monoculture agricultural crops.
- **Riparian tree buffers:** Riparian tree buffers are popular in Prince Edward Island, Nova Scotia, Ontario and Quebec. A riparian buffer physically separates agricultural activities from sensitive aquatic areas, stabilizes eroding banks and shorelines, provides habitat for wildlife, protects water quality by acting as a filter to trap sediments, and absorb substances such as nutrients (nitrogen, phosphorus), and pesticide compounds.
- **Tree intercropping:** Tree intercropping (also known as alley cropping) is common in Ontario, Quebec and New Brunswick. Tree intercropping is a cropping practice in which trees and crops are interplanted throughout a field. In this system, arable crops are grown between rows of high-value trees to maximize benefits and productivity per unit area of land. Tree intercropping can diversify farm income, increase crop yield, and provide crop conservation benefits.
- **Silvopasture:** Silvopasture is a common practice in Quebec and interior British Columbia. Silvopasture is a regenerative practice in which pasture, livestock, and trees are intentionally integrated, providing an opportunity to address climate change and improve pasture productivity. Silvopasture systems provide shade and winter shelter for livestock, increase pasture acreage and diversity, increase utilization of existing farm woodland, increase forage availability in the middle of summer and during droughts, diversify livestock diet, and improve farm animal welfare.
- **Farm woodland:** In Ontario and Quebec, farm woodlands are common practice. Private enterprises can use this farming practice to grow desirable non-timber forest products

(mushrooms, wild berries, medicinal herbs, honey, maple syrup, and nuts) on private lands, supplement family income, and allow biodiversity to reestablish within woodlots.

Question 2: What is the impact of agroforestry on soil health in Canada?

Response: It is crucial to recognize that the carbon pools within agroforestry systems are subject to a multitude of influencing factors, such as tree species, density, maintenance, soil conditions, site characteristics, age, and local climate. Agroforestry practices offer a wide array of soil health benefits, encompassing improvements in soil-water relationships, soil erosion control, reduced soil compaction, heat regulation, nutrient supply, water quality, microbial activity, and biodiversity. Through the integration of agroforestry, we can further enhance the physical, chemical, and biological properties of our soils, providing essential environmental services such as:

- Using trees with deep roots to bring up vital nutrients for crops and vegetation.
- Adding organic matter to the soil through litter to support soil biodiversity and functions such as nutrient cycling, soil health and land productivity.
- Providing greater crop diversification to reduce risks associated with monoculture soil degradation, pests and disease.

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Overall, agroforestry can have a positive and long-term impact on soil health in Canada when properly planned and managed, promoting both agricultural productivity and environmental conservation.

Question 3: What are the economic and environmental benefits of agroforestry for farmers and ranchers?

- **Economic benefits:**
  - The contribution of agroforestry to Canada's competitiveness is multifaceted. Agroforestry systems can produce a variety of specialty agricultural products and provide producers with a diverse income stream. Examples include: timber, biomass for energy, mushrooms, maple syrup, wild berries, and nuts.
  - Shelterbelts can save energy and lower heating costs by shielding homes and farmyards from cold winds; reduce the cost of snow removal along rural roads; and trap snow to improve soil moisture and reduce wind erosion.
  - A recent quantification of carbon stocks with agroforestry systems in central Alberta from hedgerows, shelterbelts, and silvopastures revealed that 699.9 million tons (Mt) of carbon were stored across 9.5 million hectares (Mha) of land and were valued at $102.7 billion based on a Canadian carbon tax rate of $40 t^{-1} CO_2 equivalent in 2021.
  - Agroforestry can aid rural development by producing biomass on marginal land for bioenergy and low-cost heating. https://doi.org/10.1111/gcbb.12934
  - The cost of mitigating algal blooms can be decreased though the use of short-rotation coppice (SRC) production along riparian zones to absorb excess nutrients while minimizing fertilizer and chemical entry into water bodies.

- **Environmental benefits:**
  - Trees in agroforestry systems act as carbon sinks, helping to mitigate climate change by sequestering carbon dioxide from the atmosphere.
  - Shelterbelts increase crop yields by providing wind protection and improving water-use efficiency.

- Tree roots hold soil in place, increasing water retention capacity and preventing flooding.
- Riparian buffers near stream banks help to reduce sediment flow into water bodies.
- The presence of trees and vegetation in agroforestry systems can moderate temperature extremes and provide shade, reducing stress on crops and livestock during extreme weather events.
- Woody vegetation improves biodiversity by providing wildlife habitat, nesting sites for birds, and refuge for beneficial insects and pollinators.
- Silvopasture offers the opportunity to offset methane emissions from cattle through the carbon-capture capabilities of their trees and shrubs.
- Greenhouse gas emissions can be reduced through microorganism (nirS gene) interactions with poplar and oak roots - Converting nitrous oxide (N2O) gas into a harmless nitrogen gas.

Question 4: What are the barriers for farmers and ranchers to adopting agroforestry practices including the insurance systems that are currently in place?

- Adoption of any agroforestry practice is dependent on acquiring suitable tree species through genetic advancements. These advancements may result in more effective carbon-sequestration, as well as environmental benefits such as phosphorus phytoremediation.
- Other barriers include the initial costs of establishment and maintenance, as well as the potential drawbacks of farmland conversion, and expected inconveniences like root obstructions in drainage systems and branches interfering with farming operations.
- Science investigation is required for developing high-potential agroforestry crops such as nuts, maple syrup, fruits, and berries, as well as their processing.
- Life cycle assessment and economic analysis is required to assess the sustainability and performance of agroforestry systems and their capacity to mitigate greenhouse gas emissions; particularly at the farm level to determine cost-benefits associated with the adoption of agroforestry practices.
- Knowledge gaps can be reduced through improved agroforestry education, demonstration sites for various agroforestry practices, and more extension to disseminate research results.
- To adopt silvopasture, ranchers need time, knowledge and technical support. The Silvopasture Learning Network is vital to foster farmer-to-farmer learning, advocate for silvopasture adoption, and facilitate volunteer efforts.

Question 5: How do these barriers vary throughout Canada?

- Agroforestry practices and barriers can differ across Canada due to the country's vast geographical and climatic diversity. Because Canada is divided into climate zones, the specific challenges and opportunities for agroforestry will vary by region.
- Access to and cost of agroforestry equipment and appropriate tree species may vary across Canada.
- Science-based guidance for tree selection is required to determine the vulnerability of tree species under climate change scenarios and position the necessary production and delivery of suitable plant materials.

Question 6: What policies or programs does the federal government offer to help farmers and ranchers transition to agroforestry practices?

- Sustainable CAP introduced the Resilient Agricultural Landscape Program (RALP), a $250-million cost-shared program to help producers conserve and enhance the resiliency of agricultural landscapes. The national BMP list contains some practices for which tree planting is allowed under RALP, however eligible activities may vary by province as Provines and Territories were given the opportunity to develop their RALP program by choosing BMPs that facilitate locally-based initiatives that are adapted to local conditions and promote regional flexibility.