Carbon Farming in Alberta Greenhouse Industry

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Drs Mohyuddin Mirza, Ron Howard and Kwesi Ampong-Nyarko have established that the carbon foot print of the Alberta greenhouse industry is around 235,706 metric tons carbon dioxide equivalent (CO2-e) per annum. This is equivalent to: CO2 emissions from 23,153,831 gallons of diesel consumed. Or Carbon sequestered by 3,897,449 tree seedlings grown for 10 years. The most common greenhouse gases (sometimes abbreviated GHG) are carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). The Alberta Greenhouse Industry's GHG footprint is the total amount of these gases that the industry discharges. This carbon footprint is the result of the industry use of production inputs including, heating (natural gas), electricity, fertilizer, water, building material, and transportation. The industry is taking some general steps to reduce its carbon footprint on a larger scale. Perhaps the commonest way is through energy efficiency improvements. Energy is one of the most important elements in Agricultural production. It is invested in various forms: mechanical (farm machines), electrical, heating, chemical fertilizer, pesticides, processing, and distribution. Energy is used to maximize yield and minimize labour-intensive practices. Efficient use of energy resources is crucial to meet escalating competition and to increase productivity. All the measures that are suitable to reduce the specific energy input, will improve energy efficiency. Improving energy efficiency of greenhouse production contributes directly to the reduction of GHG emissions, particularly carbon dioxide.

In recent years the concept of carbon farming has been promoted as agriculture's answer to climate change. Carbon Farming is simply farming in a way that reduces GHG emissions or captures and holds carbon in vegetation and soils. It seeks to reduce emissions in its production processes while increasing production and capturing carbon. The way that carbon is captured in trees and plants is by way of photosynthesis. Green plants use light energy to change water and carbon dioxide into oxygen and sugars. A single hectare of mature trees absorbs approximately 6.4 tons of CO2 per year. Around the world, a growing number of farmers are exploring the potential of carbon farming as a way to combat climate change. Some best practices that qualify as carbon farming methods include:

- The use of cover crops: cover crops are crops planted after the harvest of the main crop, to prevent the land to be fallow. They fix additional carbon from the air by photosynthesis and offer additional biomass to the soil.

- Improved crop rotation: When growing a wider variety of crops and perennial grass crops, a more diverse farming system is created. Such soils have a greater ability to store carbon and increase the carbon content in the soil through the extensive rooting system.

- Agroforestry: Agroforestry is a cropping system in which trees or shrubs are grown around or among crops or pastureland. Trees fix CO2 from the

atmosphere in stems, leaves and their extensive rooting system. Especially roots will increase the soil carbon content also in deeper soil layers.

- **Conservation tillage and no-till:** Tillage often has a negative effect on soil life, leading to CO2 emissions from the soil. Reducing soil disturbance therefore is a useful tool to protect soil organic matter.

- **Fertilisers rich in organic carbon:** Fertilisers such as compost and solid manure have a slow carbon turnover compared to other materials. They should be part of the farming system.

- **Permanent grassland:** Organic matter builds up below the grassland.

- **Adoption of precision agriculture** tools offers more accurate and efficient use of fertilizers, water and crop inputs.

The benefits of carbon farming (in addition to carbon capture) include less erosion; better soil structure and fertility; less soil salinity, healthier soils, more biodiversity; and greater water use efficiency. In addition, carbon farming may also offer additional farm income. The emergence of carbon farming is leading to the creation of carbon markets in which corporations can buy carbon from farmers and land managers who capture and store carbon above and below ground and so compensate for their own GHG emissions. The carbon-emitting corporations make payments to reward growers for taking action to protect and plant trees or otherwise increase the carbon content of soils and vegetation on the land they manage. Many countries are now considering policies to allow landholders to access the carbon market. It is assumed that the value of carbon credits generated through the carbon farming is likely to be quite modest relative to main greenhouse production income. Project agreements are long term in nature for example a minimum of 25 years and up to 100 years to gain the full value of carbon. It will also require the participation of many growers to have the desired impact.

Generally, options in the greenhouse industry for carbon farming is limited. There is small opportunity to change soil management to improve carbon storage within the greenhouses. Consequently, the main direct participation by the greenhouse industry will be through environmental plantings by greenhouse operators and landowners. Growers could convert some fields they manage back to grasslands and forests, which store far more carbon in their leaves, trunks, roots, and soil. Land managers may increase the amount of carbon stored on their land through revegetation. Revegetation along waterways, for example, can improve water quality and have biodiversity benefits. Integrating trees into agricultural systems can protect soils, prevent erosion and provide biodiversity habitat, as well as protect livestock. They could reduce tillage on a farm in a way that increases soil carbon. They can reduce or avoid emissions, for example through the capture and destruction of methane emissions from landfill or livestock manure.

In summary, for the Alberta Greenhouse Industry to reduce its carbon foot print in the short term, the focus will continue to be on greenhouse productivity and energy efficiency improvements. Increasing productivity (yield per square m) in greenhouse crops through, better processes, greenhouse environmental monitoring and control, nutrient management, crops, irrigation and integrated pest management, will reduce the pressure to expand greenhouse areas. The greenhouse crops being grown in Alberta greenhouse removes about 5% of the carbon generated through photosynthesis. In addition, growing crops locally has added benefits. Imported horticultural products are a source of significant GHG emissions. For example, imported tomato and cucumber could be substituted to a large degree by greenhouse-grown tomato in Alberta and should be encouraged. ■

AGGA Alberta Greenhouse Growers Association