CHARTING A PATH TO CARBON NEUTRAL AGRICULTURE

SUMMARY

In December of 2015, Monsanto announced a commitment to make its operations carbon neutral by 2021. Part of Monsanto's initiative includes sharing data and modeling results with the broader agriculture communities. This is done in hopes of encouraging the adoption of best practices and reinforcing the role crops can play in reducing greenhouse gas (GHG) emissions.

To further that commitment, Monsanto released a study in May 2016 titled *Charting a Path to Carbon Neutral Agriculture: Mitigation Potential for Crop Based Strategies*. The report, commissioned by Monsanto and prepared by ICF International, highlights the potential for reducing GHG emissions in the United States with crop-based strategies. The study is based on "readily available data"—publicly available data sets and published research findings.

"This report provides a 3rd-party life-cycle assessment of the mitigation potential for strategies that align with global conversations regarding the significant benefits provided by farmers that adopt these practices" according to Dr. Michael Lohuis of Monsanto. *"The life-cycle assessment demonstrates the greenhouse gas benefits of alternative crop-based management strategies, and, hence, the opportunity of agriculture to be part of the solution in addressing climate change. The life-cycle assessment will support the agriculture sector in setting priorities to meet the World Business for Sustainable Development's 2050 Vision Goals toward improved carbon management in the agriculture sector"*, says Diana Pape of ICF International.

The report documents the following four strategies, listed in order of ease of implementation:

Sustainable nutrient management

The study found that precision agriculture and nitrification inhibitors were effective in reducing GHG emissions. Precision agriculture (specifically, variable rate technology [VRT], which indicates the appropriate amount of inputs necessary for each part of a field; and swath control using GPS guidance to reduce the wastage of overlaps in fields) gives farmers the ability to manage their fields in a more exact manner. In effect, users of VRT and swath control can potentially apply inputs with much more efficiency, wasting fewer nutrients and fuel in doing so. Using nitrogen inhibitors (chemicals that slow down the nitrification process) reduces nitrogen loss and the amount of fertilizer applied to crops that is needed to achieve the same yield.

Sustainable tillage and use of cover crops

When soil is tilled, especially using conventional tillage, there is an increase in the oxidation of soil organic carbon (SOC) to carbon dioxide (CO_2); basically, intense tillage means the soil loses carbon—a component vital to soil health—and more CO_2 is released into the atmosphere. Reducing tillage, either by reducing tilling intensity or decreasing to no-till practices, immediately decreases the amount of SOC loss—good for the soil, and good for the atmosphere. The plant material left on the soil surface after harvest (which used to be tilled under) is good for soil health. Likewise, planting cover crops has shown to prevent nutrient losses and also helps to build and keep carbon stored in the soil.

Ethanol production from corn and corn stover

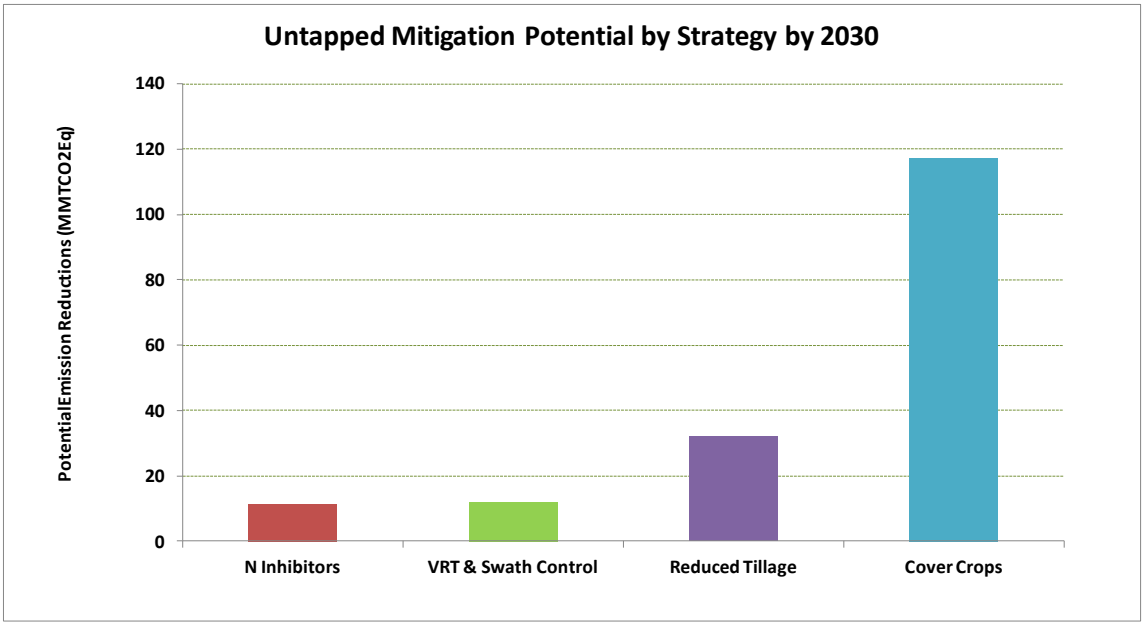
In the United States, excess corn not needed for the food supply, can be used toward ethanol production. Additionally, sustainable corn stover—the stalks, leaves, and cobs left on the field after harvest that exceed soil health maintenance needs—is a renewable source of material that may also be used in biofuel production. This strategy aims to offset fossil fuel emissions and, in collecting sustainable stover, helps farmers in reducing problems with excess crop residue post-harvest.

Optimization of the use of available crop residues

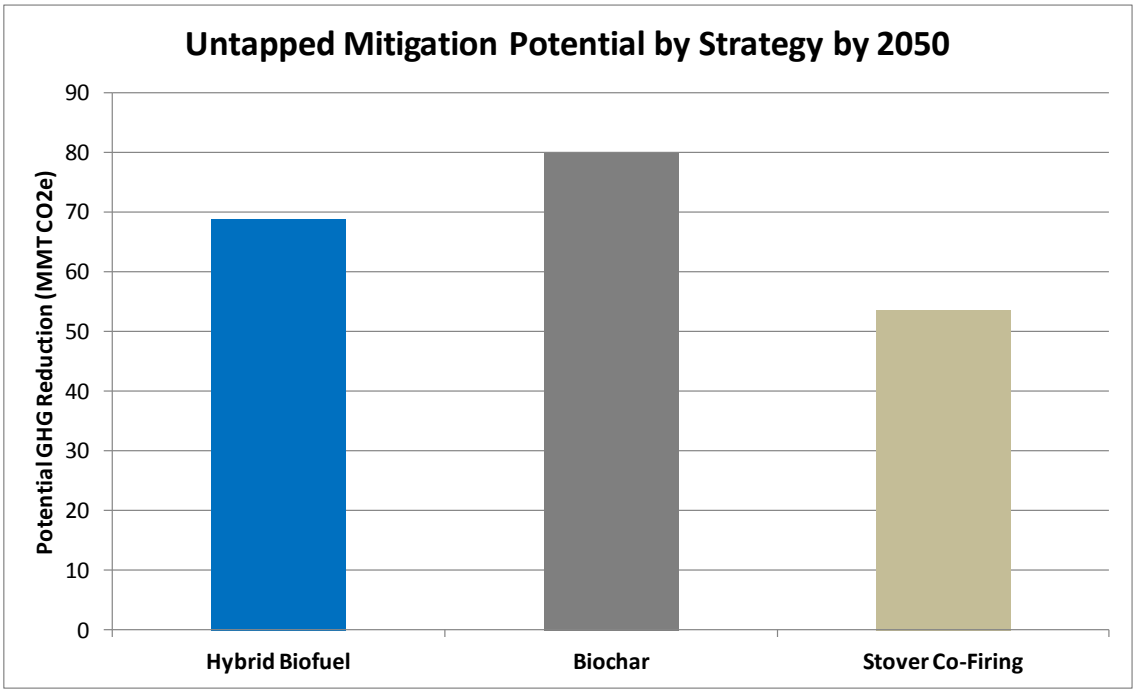
There is a possibility that available corn stover could be co-fired alongside coal in coal-fired power plants to offset the use of fossil fuel, and to provide a renewable source of energy. Available corn stover can also be processed into biochar (plant-based charcoal) that could be incorporated into the soil to increase soil health and store carbon.

The four strategies are further divided into two categories: Near-Term Strategies, with the potential for likely adoption by 2030; and Long-Term Strategies, with the potential for feasible adoption by 2050.

> Near-Term Strategies: Use of cover crops, reduced tillage, precision agriculture, and the use of nitrification inhibitors



Long-Term Strategies: Ethanol production from excess corn and available corn stover, biochar production and incorporation in soil, and co-firing corn stover with coal



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If 60 percent of cropland not currently using near-term strategies begins to adopt the near-term practices by 2030, over 100 million metric tons of CO_2 emissions reductions could be achieved from U.S. agriculture alone. More than 90 percent of that potential could be accomplished from adopting these practices for corn and soybean crops.

The long-term strategies each have similar mitigation potentials (54–80 million tons of CO_2 by 2050) but it will take time to fully realize this potential because technological and economic barriers currently exist for the adoption of these strategies. While technically possible, more research into and investment in these strategies is needed before this level of mitigation could be achieved.

The ICF report is available to view online.

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