Can Climate-Smart Ag Live Up to Its Expectations?

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You may have heard the term "climate-smart" that has been recently circulating on many media outlets. Although it has been widely disseminated, it often comes with limited explanation on what it exactly means.

The term "climate-smart agriculture" was first introduced in 2010 in a report by the Food and Agriculture Organization of the United Nations (FAO) entitled "Food Security and Agricultural Mitigation in Developing Countries: Options for Capturing Synergies", which was launched at the Barcelona Climate Change workshop held in November of that year. One of the conclusions of this report was that while farming was adversely impacted by climate change, it also contributed to changes in global climatic patterns. The report also introduced the concept of climate-smart agriculture as mean to deal with the dual challenge of addressing agricultural greenhouse gas emissions and crop productivity.

Since it was first launched in 2010, the concept of climate-smart agriculture has evolved quite a bit to address the concerns of multiple stakeholders. In the U.S., the concept of climate-smart agriculture has been endorsed by many local, state, and federal entities, including the USDA, NRCS, and various for-profit and non-profit organizations. Climate-smart strategies are often associated with farming, ranching, or forestry management practices that reduce greenhouse gas emissions or sequester carbon while also maintaining crop productivity. It typically includes 3 objectives: 1. increasing food security through increases in productivity and incomes; 2. building resilience and adapting to climate change; and 3. reducing greenhouse gas emissions compared to a business as usual or baseline scenario. Since these 3 objectives may not always be complimentary, there is a general recognition that possible trade-offs may exist. It is also recognized that the importance of regional/locally specific solutions to address the dual challenges of increasing productivity and reducing greenhouse gas emissions.

However, one of the main criticisms of climate-smart strategies is the lack of a clear methodology and/or a formal conceptual framework or tools to implement the approach. In general, there is no standardized guidance on how to define a climate-smart practice, or prioritize amongst objectives, to develop site-specific solutions. The relative rapid dissemination of the climate-smart concept along with considerable variations in its interpretation has been a major source of controversy and skepticism around the concept.

More specifically in the U.S., issues related to the overall sustainability of the beef industry have become increasingly contentious both nationally and internationally. Public misperception and lack of standardized metrics and assessment frameworks also contribute to this tension. Recent estimates suggest the beef cattle industry in the U.S. accounts for 52% of greenhouse gas emissions from animal agriculture and 25% of all agricultural emissions (White and Hall, 2017). However, when all GHG emission sources are considered, results from U.S. Beef Checkoff life-cycle analysis suggest that beef cattle production in the U.S., including all feed production, electricity use, fertilizer use, and fossil fuel combustion, represents 3.3% of total U.S. greenhouse gas emissions. Research also suggests that among the different beef cattle production sectors, the greatest greenhouse gas emissions contributions are associated with cow-calf operations, mainly due to methane emissions via livestock enteric fermentation.

Although increasing carbon sequestration rates remain a major challenge in the subtropical regions of the U.S., previous research from our group demonstrated that native and cultivated pastures in Florida have a significant potential to sequester carbon. Our data demonstrated that bahiagrass pastures can sequester as much as -900 lbs of CO_2-C per acre per month while native rangeland can reach values as high as -320 lbs CO_2-C per acre per month. On a yearly basis, both ecosystems act as strong carbon sinks sequestering between -1224 lbs CO_2-C per acre per year (native rangelands) and -2732 lbs CO_2-C per acre per year (bahiagrass pastures). Although we already provided scientific evidence that pastures in Florida are strong carbon sinks, it still is unclear to what extent management can shift carbon balance towards greater sequestration and/or reduction in greenhouse gas emissions. There is still debate in the scientific community as to what level carbon sequestration can be augmented by conservation practices. Some argue that certain practices have been oversold while others may have significant trade-offs in terms of crop productivity and/or other ecosystem services such as biodiversity, water quality, etc. The impact of a specific management practices on carbon balance is often climate-dependent and also affected by soil type making a "one size fits all" approach unrealistic. Another key question that remains unanswered is the cost and economic benefit associated with climate-smart practices.

To address these concerns, we designed a field study at the UF/IFAS Range Cattle REC in Ona to: 1. quantify important environmental benefits associated with perennial pastures in Florida, 2. evaluate potential tradeoff associated with the adoption of climate-smart management strategies on pasture productivity, soil carbon sequestration, and greenhouse emissions, and 3. examine the economic returns of different management strategies. Treatments will include the use of cover crop strategies (annual and perennial legumes overseeded into grass pastures), nutrient management (unfertilized vs. pastures receiving either organic or inorganic amendments), re-introduction of native grass species, and silvopasture systems. Although extensive literature supports the idea that the use of legumes and proper soil fertility management confer multiple agronomic and environmental benefits, the cost associated with these management practices and the monetary benefits of soil and plant improvements and ecosystem services are unknown. Economic benefits from climate-smart practices can be a result of improved forage production, greater cattle weight gains, lower fertilizer costs, and lower costs of weed control due to maintenance of healthy forage stands. Enhancing soil carbon storage can also provide greater system resilience (e.g., lesser effect of drought or adverse climate events). We expect this project will help us understand the extent that pastures in Florida can be manipulated to increase carbon sequestration and climate change mitigation.

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Upcoming Event

Nov. 14 – Ona Soil and Water Science Program Highlight webinar with Dr. Maria Silveira, 11:00 – 11:45 a.m. – an Ona Long-Term Agroecosystem Research (LTAR) Highlight."
Visit the calendar on our website for upcoming webinars. View the recording of this webinar at https://www.youtube.com/watch?v=ED7RPTit8hg

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UF/IFAS Range Cattle REC - 3401 Experiment Station Rd., Ona - http://rcrec-ona.ifas.ufl.edu/